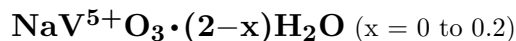


# Munirite



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**Crystal Data:** Monoclinic. *Point Group:*  $2/m$ . Crystals, to 3 mm, in radiating to spherical fibrous aggregates.

**Physical Properties:** Hardness = n.d.  $D(\text{meas.}) = 2.43$   $D(\text{calc.}) = [2.44]$  Soluble in  $\text{H}_2\text{O}$ .

**Optical Properties:** Semitransparent. *Color:* White, tinged apple-green; colorless in transmitted light. *Luster:* Pearly.

*Optical Class:* Biaxial (-). *Orientation:*  $X = c$ ;  $Y = a$ ;  $Z = b$ .  $\alpha = 1.692$   $\beta = 1.757$   
 $\gamma = 1.800$   $2V(\text{meas.}) = 75^\circ$

**Cell Data:** *Space Group:*  $P2_1/a$  (synthetic).  $a = 16.72(2)$   $b = 3.636(3)$   $c = 8.015(6)$   
 $\beta = 111.0(1)^\circ$   $Z = 4$

**X-ray Powder Pattern:** Bhimber area, Pakistan.

7.85 (100), 3.297 (90), 2.685 (80), 4.134 (70), 2.984 (70), 6.74 (50), 1.820 (50)

## Chemistry:

	(1)	(2)
$\text{V}_2\text{O}_5$	67.46	58.24
$\text{Na}_2\text{O}$	22.91	19.84
$\text{H}_2\text{O}$	10.26	21.92
Total	100.63	100.00

(1) Bhimber area, Pakistan; by AA,  $\text{H}_2\text{O}$  by the Penfield method, yielding  $\text{Na}:\text{V} = 1:1$ .

(2)  $\text{NaVO}_3 \cdot 1.9\text{H}_2\text{O}$ .

**Occurrence:** On sandstone, presumably formed from oxidation of vanadium-bearing primary uranium minerals.

**Association:** n.d.

**Distribution:** From the Bhimber area, Azad Kashmir, Pakistan.

**Name:** Honors Munir Ahmad Khan, Chairman, Pakistan Atomic Energy Commission.

**Type Material:** Atomic Energy Minerals Centre, Peshawar, Pakistan; The Natural History Museum, London, England, 1983,196.

**References:** (1) Butt, K.A. and K. Mahmood (1983) Munirite, naturally occurring sodium vanadium oxide hydrate, a new mineral. *Mineral. Mag.*, 47, 391–392. (2) (1984) *Amer. Mineral.*, 69, 812 (abs. ref. 1). (3) Björnberg, A. and B. Hedman (1977) The crystal structure of  $\text{NaVO}_3 \cdot 1.89\text{H}_2\text{O}$ . *Acta Chem. Scand.*, A31, 579–584. (4) Evans, H.T., Jr. (1988) The crystallography of munirite,  $\text{NaVO}_3 \cdot (2-x)\text{H}_2\text{O}$ . *Mineral. Mag.*, 52, 716–717.